



Investing in Toll Highway: Private or Public Financing with Scenario-Based Solution

Mazlan Hassan^{1*} and Abdul Razak Ibrahim²

¹*Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*

²*College of Business Administration, King Saud University, 11451 Riyadh, Saudi Arabia*

ABSTRACT

Whilst governments worldwide juggle competing priorities within the context of limited budgets, Malaysia has acted to seek more effective ways of building highways. In Malaysia, private involvement is allowed for the construction of highways in order to stimulate economic activity that is rarely matched elsewhere. This private finance involvement is able to reduce the public sector workforce and increase employment opportunities. However, most of the private or public/private toll highway project partnerships in the 80s and 90s have yet to yield any hard evidence of being successfully profitable, since few of the typically 30- to 50-year concession agreements have yet to mature. This paper provides a financing appraisal and scenario-based solution to aid private or public decision-making to finance highway projects.

Keywords: Toll highway, private financing, public financing

INTRODUCTION

Private investment of toll highways in Malaysia can be traced back to the late 1980s (Expressway, 2010). The Malaysian Highway Authority (MHA) was originally responsible for completing the entire North-South Expressway, which stretches over 900 km between Bukit Kayu Hitam (in the

north) to Johor Bahru (in the south). To date, it is the largest (and the longest) single toll road project in Malaysia, and was originally developed in response to traffic saturation on Federal Route 1, which runs both north and south of Kuala Lumpur (MITI, 2009). However, in order to finance the remaining sections, the government chose to privatize the construction programme, and in 1988, the MHA's role was transferred to the newly-formed private company "Project Lebuhraya Utara-Selatan Berhad" (PLUS Ltd). The government's interest was bolstered by

ARTICLE INFO

Article history:

Received: 30 April 2012

Accepted: 30 September 2012

E-mail address:

mazlanhs@upm.edu.my (Mazlan Hassan)

* Corresponding author

their agreement to provide a loan facility, if traffic levels were lower than expected, during the first 17 years of the concession period. Companies like PLUS, Grand Saga (Concession Company for the Cheras-Kajang Highway), Maju Expressway MEX (Operator for the KL-Putrajaya Highway), Besraya (Operator of the Besraya Highway from the Istana Interchange to the UPM Interchange), and East Coast Expressway ECE (Operator for the Kuala Lumpur-Karak Highway), are good examples of those that have obtained these benefits to finance their toll highway businesses.

This paper provides a financing appraisal of the key issues prevalent to the costs incurred in building highways. Essentially, a good highway network is a prerequisite - though by no means a guarantee - of positive economic development. In view of the strategic role of good highways in a country's economic development and the large investment required, a careful financing appraisal of these investments is crucial. These findings will hopefully provide a comprehensive review of all aspects of project costs and laydown a foundation for the implementation of private or public finance involvement. The two main objectives of this study are:

- to improve decision-making using a scenario-based solution; and
- to carry out an appraisal of financial issues.

METHOD OF DATA COLLECTION

Before a toll highway is built in a given region, it is impossible to calculate the influence of tolls on the diversion of traffic from existing roads to toll highways due to the absence of empirical data. The usual approach, in such a situation, is to conduct questionnaire surveys amongst potential users such as car drivers, truck drivers, and large fleets of company cars. In this study, data were gathered from feasibility studies that had been carried out by a local consulting engineering firm in Malaysia. However, due to confidentiality, some of the data had to be predicted and several issues could only be appraised briefly. In addition, traffic composition data for 2010 from the Roads Branch, Public Works Department of Malaysia, were used to predict traffic levels.

FINANCIAL VIABILITY AND FINANCING PROJECT COSTS

Whether tolls are applied to an entire network, to a stand-alone highway, or to a segment of highway, the most fundamental issue is whether the income from the tolls will be sufficient to cover the costs of building and maintaining the highway. If not, the project will be unfeasible from the very start. The financial viability structure includes:

- i. Construction costs – in full or in part. In some cases, these may include the cost of acquiring the necessary land.
- ii. Maintenance costs – including the cost of collecting tolls during the toll-bearing period of the highway's existence.

- iii. Financing costs – the costs of raising funds to finance the project; principally the cost of interest payments.
- iv. Profit – will be set at zero for an entirely public-financed initiative project, but will be required for privately-financed or public-private partnership initiative projects. Levels to be set during the concessionary period.

Additionally, there are various methods of financing project cost of a toll highway. Referring to the kinds of partnership between the public and private sectors in toll highway businesses from a financing viewpoint, two basic patterns emerged: (1) project finance system; and (2) other modes of financing. Project finance systems are adopted in concessionaire-type public-private partnership finance initiatives using formulas such as Built Operate Transfer (BOT), Built Transfer Operate (BTO), and Built Lease Transfer (BLT). Project finance systems are claimed to be amongst the most reliable tools for converting a system of inclusive financing, backed by the credit-worthiness of the government, into a system that allows concessionaires to raise funds directly from financial markets under conditions of 'small government'. Another mode of financing is the non-project finance system, where, rather than raising finance for the entire project, with a view to repaying the investment from operating revenue, the concessionaire has a contractual arrangement with a separate body to whom it would sell the completed highway.

Similarly, a financial feasibility study is carried out to estimate cash flow. This analysis aims to obtain the financial rate of return and the methods employed are similar, where a discount rate is calculated to equalize the net present values of expenditure and income. Expenditure is comprised of construction costs, right-of-way acquisition costs, maintenance and operating costs, fund raising costs, and interest. In this study, the capital value method is used, by referring to the variant of "Net Present Value" (NPV). In the NPV variant, the forecast expenditure is discounted to be present at that time. According to the capital value method, the project is recommended; if it shows a positive capital value, in the case of the net present value variant, a "value greater than null (NPV value > 0); and in the final value variant, a 'value greater than a horizon value of the alternative capital investment (Sheila, 1994).

TRAFFIC VOLUME FORECASTING FOR TOLL HIGHWAYS

Traffic volume forecasts are the most fundamental data during the financial analysis of a highway, from the planning stage onwards. They influence the fundamental decision of whether the highway should be a toll highway or not; and later, they influence decisions of setting and adjusting toll levels during a collection period. In Malaysia, when a large-scale toll highway is planned, the financial institutions investing in them usually conduct their own traffic volume surveys to verify the would-be concessionaire's forecast. In this study,

the forecast takes into account recent traffic-growth. This was obtained after applying the growth rates of 5% for 2000 to 2010 and 4.0% for 2010 to 2025 to the base year 2000. Meanwhile, traffic volumes were obtained from the JKR's Road Traffic Model of 2009 (Ministry of Works Malaysia, 2009). Meanwhile, traffic forecasting was extrapolated from the previous trends based on the traffic model for the Seremban - Kuala Lumpur expressway. This figure was based on the available traffic records between the 1995 and 2005 (Department of Statistics, 2009). It was predicted that traffic on the new highway would come from two sources: 1) traffic diverted from existing roads, and 2) traffic generated by reduced transport costs.

The average daily traffic on the old road was 60,000 vehicles. During the next 20 years, i.e. before the completion of the new highway, passenger car traffic was estimated to increase by 5% between 2000 and 2010 and by 4.0% between 2012 and 2020 (Department of Statistics, 2009). This

forecast took into account traffic growth and the number of completed highways since 2010. However, in this study, it was assumed that 92% of the existing traffic would divert to the new highway, whilst the other 8% remained as local traffic. This increase in traffic was allowed for after 20 years, because at that time, the highway's capacity was expected to reach 260,000 vehicles (Department of Statistics, 2009).

Similarly, reduced transport costs on the new highway were also expected to generate new traffic. Based on traffic trends (Ministry of Works, Malaysia, 2010) between Kuala Lumpur and Seremban, with the expressway's generated traffic was estimated to increase by 10% of the traffic diverted from the existing roads during the first year after completion. This would be followed by 15% during the fifth year, and another 15% during the tenth year. The traffic forecast between 2000 and 2030 is shown in Table 1.

TABLE 1
Forecast of daily traffic on the highway between 2000 and 2030¹

| Year | Diverted from existing roads | Generated traffic | Passenger Car Unit/Day |
|------|------------------------------|-------------------|------------------------|
| 2000 | 100,000 | 9,500 | 109,500 |
| 2005 | 111,500 | 16,000 | 127,500 |
| 2010 | 124,000 | 24,000 | 148,500 |
| 2015 | 148,000 | 26,500 | 164,500 |
| 2020 | 161,500 | 29,000 | 180,500 |
| 2025 | 193,500 | 33,500 | 201,500 |
| 2030 | 245,000 | 38,000 | 252,500 |

Source: The Ministry of Works, Malaysia (2010)

¹Based on Road Traffic Volume Malaysia 2010, by Highway Planning Unit Ministry of Works Malaysia

OPERATIONAL MANAGEMENT

Upon project completion, the concession company is required to maintain and operate the new highway. The following recurrent costs are expected (Sidney, 1995):

- Operation costs - wages, salaries, and utility bills.
- Building and equipment maintenance.
- Pavement resurfacing and heavy repairs.
- Transportation and depreciation charges.

Annual operation and maintenance costs for the highway were estimated at RM25 million for the entire project. However,

at least 30% of the maintenance costs are accounted for by foreign exchange and interest rates, which overshadow the actual economic cost for annual maintenance. This cost is assumed to increase gradually with the growth of traffic, until the year 2025. Additionally, major repaving is needed every sixth year, at an estimated cost of RM30 million. Nevertheless, maintenance and operation costs are estimated for 25 years only - the economic life of the project - assuming that the concession period is 30 years.

TABLE 2
Estimated Capital Funding (in millions of Ringgit Malaysia, RM)¹

| Conditions of site | Length for the entire 25km of highways | Cost Per Km. (million) | Cost Over Distance (million) |
|---|--|---------------------------|---------------------------------|
| Site 1: New site area | Construction of a new 10km dual three-lane elevated expressway. The route is assumed to be running along the mangrove swamps, peat soil area, or river banks, and partially enter the existing State Road to link the North-South Highway at any existing interchange. | 30.6 | 306 |
| Site 2: Within city vicinity | Construction of a 15km dual three-lane road, consisting of existing and new roads. The new city ring-road forms part of the circumferential route around the hub of the new town centre. | 34.2 | 513 |
| Contingency 10% | | | 78 |
| Cost of Land Acquisition and Property Acquisition | | | 198 |
| Cost of Project Management and Consultancy, Soil Investigation, and Preliminary Site Survey (15%) | | | 134 |
| Total Capital Cost | | | 1,229 |

¹Estimated costs based on the Project Lebuhraya Utara-Selatan's (PLUS) Design, Build, Operate, and Transfer (DBOT), from 1988 to present.

MULTI-CRITERIA ANALYSIS

Evaluation of toll highway projects may be roughly classified into those that are carried out before and after the road is opened. Benefits may include: (1) reduced vehicle operating costs on the new highway for traffic diverted from old roads, and generated traffic; (2) vehicle operating costs for the traffic remaining on old roads; and (3) time saved for passengers and freight (PwC, 2010).

Most benefits are estimated in terms of the traffic volume diverting from the existing roads to the newly proposed highway. Naturally, it is assumed that diverted traffic is able to enjoy all benefits, which are calculated in terms of cash as follows:

1. *Traffic diverted from old roads:*

As indicated, the average daily traffic on the highway will reach about 109,500 vehicles in year three. One reason for this is that the travel time on the new and shorter highway has been reduced to 15 minutes for cars

and about half an hour for trucks and buses. Results of studies on vehicle operations for the existing roads and the newly proposed highway indicating costs per vehicle-km are shown in Table 3.

The benefits of this diverted traffic in year three are shown in Table 4. The unit benefits for the traffic diverted from the existing road is RM 0.80 per car-km. The traffic gain by distance would be 1km less (i.e., the length of the old road is 26km and the proposed highway is 25km). Table 4 shows that the total benefits for traffic diverted is RM815.34 million. Benefits due to the shorter distance is RM175.86 (21.6%) and RM639.5 million (78.4%) by improved highway design standards.

2. *Generated Traffic*

For generated traffic (see Table 5). The unit benefit is estimated to be one-half of that used for traffic diverted from the old road. The benefit generated from traffic level is due to the increased reduction of maintenance costs.

TABLE 3
Vehicle operating costs on old roads and the newly proposed highway (in Ringgit Malaysia)¹

| Cost item | Vehicle | |
|--------------|-----------------------------------|------------------|
| | Old Road | Proposed Highway |
| Fuel and oil | 1.50 | 1.20 |
| Tyre wear | 0.50 | 0.40 |
| Depreciation | 0.80 | 0.70 |
| Interest | 0.60 | 0.50 |
| Maintenance | 1.00 | 0.80 |
| Total | 4.40 | 3.60 |
| Benefit | 4.40 - 3.60 = RM 0.80 per car-km. | |

¹Estimated cost is based on the Project Lebuhraya Utara-Selatan's (PLUS) Design, Build, Operate, and Transfer (DBOT), and the Rehabilitate, Operate, and Transfer (ROT) business model.

3. *Reduced Vehicle Operating Costs (VOC) on the Old Road*

The diversion of 92% of the traffic to the new highway is expected to reduce congestion on the existing road; and thus, benefits the remaining traffic. In year three, it is predicted that a total of 11,000 vehicles less will use the old road daily. As a result, a 5% reduction in vehicle operation costs is expected. The benefit in year three will be:

$$\begin{aligned} & 11,000 \text{ cars} \times 25 \text{ kilometres} \times 365 \text{ days} \\ & \times \text{RM } 0.20 \\ & = \text{RM } 20.07 \text{ million} \end{aligned}$$

4. *Benefit from the reduction in time for a car*

The time saved for vehicles, passengers, and freight operators using the highway, contributes to approximately 5% of the total benefit. The estimated time-saving value per passenger is RM 1.00 an hour per car and RM 2.75 an hour per freight vehicle. Assuming the economic life of a car is 4000 hours and the value per/hr. of car is RM100; the cost of delays for cars in year three (2003) is equivalent to $109,500 \times 365 \times 1 \times 0.25 / 4000 \times 100$. The total benefit from the reduction in time in year three for cars is therefore RM 8.03 million.

TABLE 4

Benefits for traffic diverted from the old road in year three (millions of Ringgit Malaysia)

| Traffic variable and vehicle | Calculation | Benefits |
|--------------------------------|---|----------|
| Shorter distance (Car) | 109,500 cars X 5 km. x 365 days X RM 4.40 | 175.86 |
| Highway design standards (Car) | 109,500 cars X 20 km x 365 days X RM 0.80 | 639.48 |
| Total | | 815.34 |

TABLE 5

Benefit for the generated traffic in year three (in Ringgit Malaysia, RM)

| Traffic variable and vehicle | Calculation | Benefits |
|----------------------------------|--|----------|
| Shorter distance (Car) | 5,700 cars X 5 km. X 365 days X RM 2.20 | 22.89 |
| Highway design standards (Car) | 3,800 cars X 20 km. X 365 days X RM 0.40 | 11.10 |
| Total vehicles (5700+3,800=9500) | | 33.99 |

TABLE 6

Reduction in time (in Ringgit Malaysia, RM)

| Year | (No. vehicles) X (days) X (reduction in time ÷ economic lifetime) X (value per hour) X (years) | Benefits |
|-----------|---|----------|
| 2004-2005 | 118,500 cars x 365 days x 1 yr. x 0.25 hr. ÷ 4000 x RM100 x 2 | 0.54 |
| 2006-2010 | 138,000 cars x 365 days x 5yrs x 0.25 hr. ÷ 4000 x RM100 x 2 | 1.57 |
| 2011-2015 | 156,000 cars x 365 days x 5yrs x 0.25 hr. ÷ 4000 x RM100 x 2 | 1.78 |
| 2016-2020 | 172,000 cars x 365 days x 5yrs x 0.25 hr. ÷ 4000 x RM100 x 2 | 1.96 |
| 2021-2025 | 191,000 cars x 365 days x 5yrs x 0.25 hr. ÷ 4000 x RM100 x 2 | 2.18 |
| TOTAL | | 8.03 |

5. Toll Rate and Revenue

The toll rate for new highways is based on the North-South Expressway's toll charges. The 2000 rate-schedule of RM 0.06 per km for cars increased by 30% in 2005, and this was by a further 20% in 2010. The current toll rate for passenger cars using the North - South Expressway (operated by PLUS) is RM0.12 per km. The subsequent revenue is forecast from the traffic modelling results. In theory, the revenue obtained in this way provides a valuable source of funds for highway maintenance planning, upgrading, and future expansion.

COSTS AND BENEFITS ANALYSIS

The benefits of the proposed highway exceed its costs - both discounted at 12% - by about RM469.3 million, during its economic life. Meanwhile, a cost:benefit ratio of almost 1:1.39 indicates that the project is well justified.

As the project has a high net worth, it is not particularly sensitive to changes in any single factor. For example, if the capital cost of the project is 25% higher than estimated, the net present value of the project is RM199.5 million. The switching value for

capital costs, that is to which this cost can rise, so that the NPV of the project becomes zero, is approximately 43%. However, traffic forecasts are inherently more speculative. In this study, approximately 90% of the benefit arose from traffic diverted from the old road. If the initial traffic diversion to the proposed highway (or the rate of traffic growth) is less than estimated (so that the benefit is 25% lower), the NPV would be reduced from RM469.3 million to approximately negative RM145.4 million, which is still substantial. The switching value for the benefits is approximately 36%.

If the project capital cost is 25% higher, and the benefit is 25% lower than estimated, the project's NPV is still RM54.1 million; and the rate of return still exceeds 12%. Under these circumstances, the project is still well-justified.

Table 8 shows that NPV in revenue exceeds NPV in costs by negative (-ve) RM239.6 million over a period of 22 years. This means the existing toll rate is insufficient; unless capital costs are reduced by at least 25%. However, the revenue is very much affected by traffic levels, which have been forecast to increase between 4

TABLE 7
Calculated revenue, based on traffic volume with a fixed toll rate (in Ringgit Malaysia, RM)

| Year | Average No. of vehicles daily | Revenue collected from tolls during this period (No. of vehicles x days x years x toll rate) |
|-----------|-------------------------------|---|
| 2004-2005 | 118,500 | 118,000 x 365 x 2 x 3.00 = 258,420,000 |
| 2006-2010 | 138,000 | 138,000 x 365 x 5 x 3.00 = 755,600,000 |
| 2011-2015 | 156,000 | 156,500 x 365 x 5 x 3.00 = 856,800,000 |
| 2016-2020 | 172,000 | 172,000 x 365 x 5 x 3.00 = 944,400,000 |
| 2021-2025 | 191,000 | 191,000 x 365 x 5 x 3.00 = 1,045,800,000 |
| TOTAL | | RM 3, 861, 440, 000 |

to 5% annually. An increase of 4 to 5% is indeed a very low percentage for a country like Malaysia, where economic growth is between 5 to 8%. Hence, it is more sensible to forecast increased traffic levels between 10 and 12% annually. In other words, the revenue will rise by almost double, i.e. from RM969.80 million to RM 2000 million. The project will certainly now be well-justified with these newly forecasted traffic levels.

However, operating costs are expected to rise gradually alongside the growth of traffic. Furthermore, recurrent costs are estimated to increase by approximately 10% annually. In addition, there is a possibility of salary increases because of the shadow price for labour, which is likely to increase over time. However, in calculating NPV for costs and revenue, the increase in toll rate during the concession period was neglected. The reason for this was to see to what extent the present toll rate could be used to sustain profitable operations, should there be no future rise in toll charges in; though in

reality, toll rates would definitely increase.

Scenario-based solutions between public, public-private partnership, and the private finance initiative are:

There are three scenarios (AASHTO, 2011):

- Public finance initiative – no toll charges being imposed.
- Public-private partnership initiative - toll charges are decided by the government.
- Private finance initiative – toll charges are decided by private investors.

SCENARIO 1: PUBLIC FINANCE INITIATIVE

The capital cost is estimated to be RM1229 million. Maintenance and operating costs are estimated at RM10.6 million annually, with an additional cost of RM20 million every sixth year for major repaving works. Since the project will be carried out solely by the government, it is expected that the interest rate will be very low. Hence, a discounted rate of 12% was adopted. Project

TABLE 8

A comparison of the associated costs and revenue (in Ringgit Malaysia, RM; million)

| Concession period | | Associated costs | | Total costs | Toll revenue | Net Present Value discounted at 12% | |
|-------------------|------------|-------------------|---------------------|----------------|--------------|-------------------------------------|--------------|
| Year (1) | Period (2) | Capital Costs (3) | Recurrent Costs (4) | Total Cost (5) | Benefits (6) | Costs (7) | Benefits (8) |
| 0 | 2000 | 410 | 0 | 410.0 | 0 | 410.0 | 0 |
| 1 | 2001 | 600 | 0 | 610. | 0 | 535.7 | 0 |
| 2 | 2002 | 220 | 0 | 220.0 | 0 | 175.4 | 0 |
| 3-4 | 2003-2004 | 0 | 21.4 | 21.4 | 258.84 | 14.50 | 184.20 |
| 4-10 | 2004-2010 | 0 | 77.0 | 77.0 | 755.60 | 34.10 | 341.80 |
| 11-15 | 1011-2015 | 0 | 82.4 | 82.4 | 856.80 | 19.20 | 219.92 |
| 16-20 | 2016-2020 | 0 | 68.4 | 68.4 | 944.40 | 10.00 | 137.54 |
| 21-2 | 2021-2024 | 0 | 95.0 | 95.0 | 1045.8 | 8.30 | 86.42 |
| Total | | | | | | 1209.4 | 969.80 |

Note: Net Present Value equals -ve RM239.6 million; this is the difference between columns 8 & 7

costs have to be reasonable since no toll would be imposed on the user. Therefore, the budget must be monitored closely to ensure that the costs do not exceed the benefits (World Economic Forum, 2011).

Expected cost-effectiveness results

- i. Project Net Present Value (NPV) = RM469.3 million
- ii. Project Cost : Benefit Ratio: 1: 1.39
- iii. If the capital cost of the project is 25% higher than estimated, the NPV of the project is still RM195.5 million.
- iv. The switching value for capital cost so that the NPV of the project becomes zero, is approximately 43%.
- v. If the benefits are 25% lower, the NPV is reduced from RM469.3 million to approximately RM145.4. The switching value for benefits is approximately 36%.
- vi. If the project capital cost is 26% higher and the benefits are 25% lower than estimated, the project NPV is RM54.1 million, which is still well justified.

The project has a high net worth, and it is not particularly sensitive to changes in any single factor (World Economic Forum, 2010). Apart from this, the project is well-justified (even though no toll will be imposed on the user). The benefits gained from a reduction in vehicle operating costs, which exceed the project costs, prove that the project is viable (PcW, September 2010). However, the discounted rate must be within 12% for the project to be justified. This should not be a problem as the government normally obtains its funds through taxation

or from bank loans, at below-market rates. Furthermore, funds obtained from foreign aid sources frequently carry interest rates substantially below the opportunity cost of capital; especially for developing countries (World Economic Forum, 2011).

SCENARIO 2: PUBLIC-PRIVATE PARTNERSHIP FINANCE INITIATIVE

This scheme is jointly funded by public and private initiatives using the Built Transfer and Operate (BTO) concept. Since public funds are involved, the capital cost in the partnership scheme will normally increase by 25% from the estimated cost of RM1230 million to a new value of RM1537.5 million. Support such investment funds will be made available to the private sector at rates below the current interest rate. This is guaranteed by the government. As a result, the discounted rate (which is a major determinant of the cost-benefit comparison) is set at 12%. The government has a say in deciding toll rates, and therefore, they can be fixed at RM 3.00 per 25km (or RM 0.12 per km). The revenue collected from toll charges is shared with the concessionaire at a ratio of 40/60 for the first year, 50/50 for the second year, 60/40 for the third year, and so on, until the end of the concession period. The ownership rights of the highway, and all ancillary structures, revert back to the government after the concession period has expired.

Expected cost effectiveness results

- i. The Net Present Value (NPV) of the project, at a discounted rate of 12%

= RM 1159.5 million, and at a 20% discounted rate = negative (-) RM 83.4 million

- ii. Project Cost : Benefit ratio = 1: 1.78
- iii. If the capital cost of the project is 25% higher than estimated, then the NPV capital cost at 12% is RM816.3 million
- iv. Switching value for capital cost, that is the extent to which these costs can rise, so that the Net Present Worth of the project becomes zero, is deemed to be 84%
- v. If the toll rate is reduced so that the benefits are 25% lower, the NPV capital cost becomes RM497.0 million and the switching value for benefits is 43%.
- vi. If the capital costs are 25% higher and the benefits are 25% less than estimated, the Net Present Worth of the project is equal to RM153.8 million

In other words, an increase in the capital cost brings a positive NPV value; in terms of costs versus benefits. Toll rates that are setup by the government are high enough to increase the total net worth benefits, even though the capital costs have increased by 25%. Nevertheless, should the discounted rate be set at 20%, the costs will exceed the benefits, which indirectly shows us that without the government's support in giving low interest rates, the project will not be justified. In addition, in BTO projects, the private sector normally wishes to recover the investment capital as soon as possible (Eddington Transport Study, 2006). For instance, the completion of the Second Expressway System BTO project in

Bangkok ended in a disaster for Kumagai Gumi. One source indicated that the Thai government seized the expressway's assets over a dispute in the amount of toll to be levied (PwC, June 2010).

SCENARIO 3: PRIVATE FINANCE INITIATIVE

Projects funded by private initiatives may reduce capital costs by a substantial amount (PwC, April, 2011). Normally, a shorter time is needed to complete such a project. With a skilled workforce and longer working-time, the duration to complete a project is shortened; therefore, the overhead expenses are reduced. Capital cost decreases to as low as 25 % from the estimated costs. As a result, the maintenance and operating costs are also reduced by approximately 20%. However, since money has to be borrowed from banks, the interest rate for the borrowed capital is much higher. In this setup, it is assumed that the project will not get any help from the government. Therefore, in order to recover the investment capital, the private consortium must set the toll-rate to recover the project's costs within 30 years.

Expected cost-effectiveness results

- i. Project Net Present Value at a discounted rate of 20% = RM334.7 million
- ii. The Cost : Benefit Ratio is 1: 1.40
- iii. If the capital cost of the project is 25% higher than estimated, then the new NPV project cost will stand at 43%.
- iv. If the toll rate is increased so that the benefits are 25% higher, then the NPV of the project will now be 188%.

- v. If the capital cost is 25% higher and the benefits are also 25% higher than estimated, the NPV of the project is equal to RM448.75 million.

The toll rate proposed in Scenario 3 is 20% lower than that of Scenarios 1 and 2, i.e., reduced from RM0.12 per km to RM 0.096 per km. However, the discounted rate is higher at 20%. This is because the concession company has to bear all of the costs of construction and related risks. Despite this drawback, the concession company is still able to make substantial returns, with a profitable net worth of RM334.7 million. This is most likely attributed to the significant reduction in capital and maintenance costs to as low as 25% and 29%, respectively. In order for the above conditions to be met, the project must be completed within a stipulated period of time. The works programmed must be strictly adhered to in order to avoid additional costs. This schedule can be built by a private sector that has extensive experience and a skilled workforce. The most important conclusion to draw here is that the private sector is able to operate the proposed expressway profitably, even at a lower toll rate. If toll revenue is collected based on a rate of RM0.096 per km, the concession company will only be able to recover their initial capital costs after 14 years of operation. Therefore, the estimation of project costs must be accurate as it has a significant impact on the overall end-return of the revenue collected. In a way, this scheme is more cost-effective and attractive than the one presented in Scenarios 1 and 2,

with regards to the following:

- A lower toll rate that will benefit both the users and the government.
- The project is fully financed by the concession company.
- There is still a good return, even with a higher loan interest rate.

HIGHWAY INVESTMENT AND BENEFITS TO ECONOMIC DEVELOPMENT

Highway projects must be evaluated in a greater context of the nation's economic development. Whether the funding structure is financed by the public or private sector, a good highway improves business efficiency through time savings and lower operating costs. It also increases employment opportunities by providing market flexibility and job accessibility. An enhanced transportation infrastructure also fosters competition by providing easier access to new markets. Additionally, good highway networks attract international trade and investment and subsequently increase domestic mobile activities. Through guidance from these benefits, the government should be able to set infrastructure investment policies and social considerations, to aid highway investment decision-making.

CONCLUSION

Toll highways in Malaysia have been privatised since 1988. Except for two that are directly run by government corporations and one by the city of Kuala Lumpur

itself, all are run privately under BOT concession systems. The 847.7 km North South highway, the 48 km central link to the North South highway, and five other highways totalling 149.9 km were run by concessionaires, as of 31 December 1997. Projek Lebuhraya Utara-Selatan Bhd. (PLUS) holds exclusive concession rights to the North South highway. This massive concessionaire and several smaller concessionaires run the toll highways in Malaysia, giving us a similar situation to that of Italy.

All toll highways are managed by Malaysia Highway Authority (MHA). MHA initially started as a toll highway operator. After undergoing an organizational change, under the national policy to privatise all toll highways, it now undertakes land expropriation and supervises concessions from planning through to construction, whilst forming and evaluating related technical standards.

Financial analysis indicates that capital costs are high. The forecasted traffic levels are low, if the calculation is based on a 4 to 5% growth. The growth of the number of vehicles in Malaysia has to be around 10 to 12% for the returns to be good over a relatively long period of time. Even though financial returns are generally good, investment in highway projects is still considered to be high risk, and thus, giving investors many unforeseen circumstances (High, 2008). Since revenue depends greatly on forecasted traffic levels, it is likely that the government will give guarantees, should low levels of traffic not be able to generate

sufficient revenue to cover operating and capital costs. However, under the concession agreement, the private operator is free to raise toll rates to achieving traffic levels above the traffic threshold. On the contrary, if the traffic levels fall below the traffic threshold and the toll rate is above the toll threshold, a penalty will be applied.

Key drivers for the involvement of private finance or public-private partnership initiatives to build a highway are as follows:

- Enhance the transportation infrastructure, which is desired to stimulate economic activity.
- More convenient and easy access nationwide.
- Shorter and more predictable journey times, reduced wear and tear on motor vehicles, and reduced fuel consumption by road users.
- Law enforcement and improved road safety benefits like breakdown and recovery assistance, ambulance services, customers call centres, etc.

In summary, no matter what the reasons are, highway investment policy in Malaysia has to take into account long-term economic, social, and environmental implications.

CONCLUDING REMARKS

In Malaysia, most toll highway concessionaires are semi-public organizations, with 100% private companies being the second most common form. Despite their name, “semi-public” companies are seldom owned 50/50 by

the government and other private interests. They are either primarily government or private. Malaysia has a vast experience in toll highway operations and out of necessity, it has undergone several reorganizations of its concessionaires. A major reason for this is that the business environment for each toll highway is unique (this includes traffic flow and construction costs) and profitability varies widely.

REFERENCES

- AASHTO Centre for Excellence in Project Finance. (2011). *The Forum on Funding and Financing Solutions for Surface Transportation in the Coming Decade: Conference*.
- Department of Statistics, Malaysia (2009).
- Ervina Alfian. (2010). The Malaysian Public-Private Partnership (PPP): *Financing Talled Highway Projects*, 3(2), 121-143.
- Expressway System. Retrieved April 1, 2010, from http://en.wikipedia.org/wiki/Malaysian_Expressway_System.
- Farid Ezanee. (2010). Operational Risks for Highway Projects in Malaysia. *International Journal of Human and Social Sciences*, 5. Retrieved on June 21, 2012, from <http://www.waset.org/journals/ijhss/v5/v5-1-4.pdf>.
- Global Economics Research*. Retrieved April 6, 2010, from <http://www.tradingeconomics.com/Economics/GDP-Growth.aspx?symbol=MYR>.
- High, R. (2008). *International Construction*, June 30. Retrieved July 1, 2011, from <http://www.khl.com/agazines/international-construction/detail/items25939>.
- Hochan, K., Youjin, S., Seungyoung, K., & Sungmo, R. (2009). Establishment of Influence Area using Select Link Analysis for Highway Investment Projects. *Journal of the Eastern Asia Society for Transportation Studies*, 8. Retrieved on June 21, 2012, from http://www.easts.info/publications/journal_proceedings/journal2010/100363.pdf.
- Invest in Malaysia*. Retrieved on April 6, 2010, from http://www.mida.gov.my/en_v2/index.php?page=invest-in-Malaysia.
- Ikechukwu, I. C., & Xiaolin, X. (2012). Public-Private Partnerships: The Underlining Principles of Infrastructure Investment, Finance, and Development Projects. *International Journal of Business and Management*, 7. Retrieved on June 21, 2012, from <http://dx.doi.org/10.5539/ijbm.v7n1p109>.
- Ministry of Works, Malaysia. (2010).
- Ministry of Works, Malaysia. (2012).
- PricewaterhouseCoopers, Cities of Opportunity. (2010).
- PwC, Game On: Mega-Event Infrastructure Opportunities. (2011).
- PwC, Public-Private Partnerships: The US Perspective. (2010).
- PwC, Survey and Analysis of Transportation Investment Models in Other Countries. (2010).
- Services Development Division, Ministry of International Trade and Industry (MITI) Malaysia. (2007). *Trade and Transport Facilitation: The Malaysian Experience and Milestones*.
- Sheila, F. (1994) *Financing Transport Infrastructure: A compilation of major papers selected from PTRC's Summer Annual Meeting and Conferences*.
- Sidney, M. L. (1995). *Build, Operate, Transfer; Paving the Way for Tomorrow's Infrastructure* (pp. 25-46). John Wiley & Sons, Inc.
- Kent, S. (2008, December). Passing the Torch. *PM Network*.

- The Eddington Transport Study: The Case for Action (2006).
- The Ministry of Works Malaysia. (2010). Retrieved on July 1, 2011, from
- World Economic Forum. (2010). Global Risks 2020. *A Global Risk Network Report*.
- World Economic Forum. (2010). *The Global Competitiveness Report, 2011-2012*.

